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09/719,721	12/16/2000	Joji Yoshimura	2013/19	3612

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EXAMINER

TSANG FOSTER, SUSY N

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1745

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Please find below and/or attached an Office communication concerning this application or proceeding.



## **DETAILED ACTION**

### ***Response to Amendment***

1. This Office Action is responsive to the amendment filed on 12/8/2003. Claims 2-7, 9, 11, 16, 19, and 20 have been amended. Claims 1, 8, 10, 12-15, 17, 18, and 21-26 have been cancelled. Claims 27 and 28 have been added. Claims 2-7, 9, 11, 16, 19, 20, 27, and 28 are pending and are finally rejected for reasons of record and for reasons necessitated by applicant's amendment.

### ***Claim Objections***

2. Claims 27 and 28 are objected to because of the following informalities:

In claim 27, the preamble "A gas separator for a fuel cell constructed as a laminate of plural layers including electrolyte layers and electrode layers" is grammatically awkward because the phrase "constructed as a laminate of plural layers including electrolyte layers and electrode layers" seems to be modifying the gas separator instead of the fuel cell.

In claim 28, the preamble "A method of manufacturing a gas separator for a fuel cell constructed as a laminate of plural layers including electrolyte layers and electrode layers" is grammatically awkward because the phrase "constructed as a laminate of plural layers including electrolyte layers and electrode layers" seems to be modifying the gas separator instead of the fuel cell.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 11 and 20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claim 11, the limitation “wherein each of said at least two plates is a metal plate” is not in the original disclosure. Instead, the specification originally discloses two plates that have the rugged shapes and does not disclose at least two plates that have the rugged shapes (see for example, page 3, lines 9-23, pages 5-8 of the substitute specification).

Claims depending from claims rejected under 35 USC 112, first paragraph are also rejected for the same.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 5, 7, 11, and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Art Unit: 1745

Claim 5 recites the limitation "the fuel cells" in the last line. There is insufficient antecedent basis for this limitation in the claim. Claim 27 from which claim 5 depends is drawn to "a fuel cell".

Claim 7 recites the limitation "gas separators for a fuel cell in accordance with claim 27" in lines 4 and 5. There is insufficient antecedent basis for this limitation in the claim. Claim 27 is drawn to "a gas separator", not "gas separators".

Claim 11 recites the limitation "said at least two plates" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim.

Claims depending from claims rejected under 35 USC 112, second paragraph are also rejected for the same.

### ***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 2-5, 7, and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Wilkinson et al. (US 5,521,018).

Art Unit: 1745

Wilkinson et al. disclose a gas separator for a fuel cell wherein two plates of graphite foil are laminated with a metal foil layer interposed between the two plates of graphite foil (see abstract; Figures 5a, 5b, 7a and 7b; col. 5, lines 29-35). The lamination bonds the two plates of graphite foil and the metal foil layer with one another. Thus, the metal foil is located in a space between the two graphite foils and bonds the two graphite foils to one another. Wilkinson et al. also disclose that graphite foils comprise an embossed surface (rugged shapes) (col. 6, lines 37-56). Wilkinson et al. also disclose that other suitable electrically conductive material sufficiently soft so as to permit embossing can be used as the two outer layers of the separator such as corrosion resistant metals such as niobium and somewhat corrosive resistant metals such as copper (col. 10, lines 24-39). The gas separator may be used as a flow field plate for fuel or oxidant or coolant (col. 11, lines 15-39 and col. 12, lines 10-34).

9. Claims 2-7, 9, 11, 16, 19, 20, 27, and 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Yoshimura et al. (US 6,291,094 B1).

Yoshimura et al. disclose a gas separator in the form of a bipolar plate for supplying and discharging fuel and an oxidizing agent in a fuel cell stack (col. 4, lines 48-61). The gas separator comprises two base metal plates 65 and 66 having predetermined corrugations (rugged shapes) formed by mechanically pressing thin stainless steel plates in step S100 (see Figures 4-11 and col. 6, line 6 to col. 16, line 35 of the reference, specifically col. 6, lines 15-17) and that in step 130, the base sheets 65 and 66 are joined face to face to complete separator 64 by employing an adhesive such as an electrically conductive paste which is a member (the electrically conductive adhesive) located in a space defined between the two plates and bonding

Art Unit: 1745

the two plates together (col. 7, lines 9-14). The two base metal plates can also be made of aluminum (col. 8, lines 29-45). The electrically conductive paste is also inherently thermally conductive to some degree because an electrical conductor is not a thermal insulator. As seen in Figure 3, the fuel cell is constructed as a laminate of plural layers including electrolyte layers and electrode layers and the gas separator being adapted to form one of the plural layers. The corrugations in each plate are adapted to define at least part of a flow path of reactant gases (fluids) passing inside the fuel cell (col. 4, lines 24-36).

***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 3-5 and 27 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Mukohyama et al. (US 5,798,188).

The product-by-process limitations of claims 3-5 and 27 are not given patentable weight since the courts have held that patentability is based on a product itself, even if the prior art product is made by a different process (see In re Thorpe, 227 USPQ 964, (CAFC 1985), In re Brown, 173 USPQ 685 (CCPA 1972), and In re Marosi, 218 USPQ 289, 292-293 (CAFC 1983)).

Art Unit: 1745

Mukohyama et al. disclose a gas separator for a fuel cell stack comprising rugged shapes that are formed in both faces of the separator to define a flow path of a fluid and two metal layers (reference label 4 in Figure 1 and col. 2, lines 16-67) with rugged shapes are formed in respective one faces of the gas separator. The gas separator also comprises an aluminum plate 2 and polymer projections (a member) located in a space defined by the rugged shapes (see col. 1, lines 15-30; col. 3, lines 5-35; col. 5, lines 19-29). The aluminum plate and the polymer projections are inherently thermally conductive. Furthermore, the thin metal layers are bonded to the polymer projections and exposed aluminum plate since the surface of the projections and the exposed surface of the aluminum plate are surface treated with a metal coating that is applied by methods such as sputtering, chemical vapor deposition, and physical vapor deposition (col. 3, lines 19-35).

12. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mukohyama et al. (US 5,798,188) in view of Walsh (US 6,096,450).

Mukohyama et al. disclose all the limitations of claim 5 except that a cooling fluid for cooling down the inside of the fuel cells is introduced as a fluid passing through one of the flow path defined by the rugged shapes on one surface of the gas separator. Mukohyama et al. disclose that the gas separator is a bipolar plate for supplying and discharging fuel and an oxidizing agent (see col. 2, lines 35-46).

Walsh teaches that a fluid flow plate for a fuel cell may be bipolar, monopolar, combined monopolar such as an anode cooler or cathode cooler, or a cooling plate and that flow channels



Art Unit: 1745

of the fluid flow plate can carry reactant gases, as well as liquid and the function of the fluid flow plate is a matter of design choice for a fuel cell system (col. 5, lines 35-45 and col. 9, lines 64-67 and col. 10, lines 1-16).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the gas separator plate of Mukohyama et al. as a cathode or anode cooling plate having cooling fluid for cooling down the inside of the fuel cells because cooling of a fuel cell stack is necessary for proper temperature maintenance of a fuel cell stack during normal operation and gas separator plates (flow field plates) in the fuel cell art are adaptable for a variety of uses such as a bipolar, monopolar, combined monopolar such as an anode cooler or cathode cooler, or a cooling plate depending on the requirements of a fuel cell system.

13. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshimura et al. (US 6,291,094 B1) in view of Walsh (US 6,096,450).

Yoshimura et al. disclose all the limitations of claim 5 except that a cooling fluid for cooling down the inside of the fuel cells is introduced as a fluid passing through one of the flow path defined by the rugged shapes on one surface of the gas separator. Yoshimura et al. disclose that the gas separator is a bipolar plate for supplying and discharging fuel and an oxidizing agent (col. 4, lines 48-61).

Walsh teaches that a fluid flow plate for a fuel cell may be bipolar, monopolar, combined monopolar such as an anode cooler or cathode cooler, or a cooling plate and that flow channels of the fluid flow plate can carry reactant gases, as well as liquid and the function of the fluid

Art Unit: 1745

flow plate is a matter of design choice for a fuel cell system (col. 5, lines 35-45 and col. 9, lines 64-67 and col. 10, lines 1-16).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the gas separator plate of over Yoshimura et al. as a cathode or anode cooling plate having cooling fluid for cooling down the inside of the fuel cells because cooling of a fuel cell stack is necessary for proper temperature maintenance of a fuel cell stack during normal operation and gas separator plates (flow field plates) in the fuel cell art are adaptable for a variety of uses such as a bipolar, monopolar, combined monopolar such as an anode cooler or cathode cooler, or a cooling plate depending on the requirements of a fuel cell system.

14. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilkinson et al. (US 5,521,018) in view of Cisar et al. (US 6,146,780).

Wilkinson et al. disclose all the limitations of claim 6 except that the two plates are composed of stainless steel.

Wilkinson et al. also teaches that the two plates are suitably electrically conductive material sufficiently soft so as to permit embossing can be used such as corrosion resistant metals such as niobium and somewhat corrosive resistant metals such as copper (col. 10, lines 24-39).

Cisar et al. teach that bipolar separator plates are typically made from a variety of metals such as stainless steel (col. 1, lines 15-20).

Art Unit: 1745

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the two plates of the separator of Wilkinson et al to be made of stainless steel because stainless steel is a corrosion resistant metal for a fuel cell system.

15. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilkinson et al. (US 5,521,018) in view of Wilson et al. (US 6,037,072) .

Wilkinson et al. disclose all the limitations of claim 6 except that the two plates are composed of aluminum.

Wilson teaches a bipolar separator plate made of aluminum that adequately withdraws heat from a fuel cell (col. 2, lines 39-46).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the two plates of the separator of Wilkinson et al to be made of aluminum because aluminum is lightweight and has sufficient thermal conductivity to withdraw heat away from the fuel cell.

#### ***Response to Arguments***

16. Applicant's arguments filed 12/8/2003 have been fully considered but they are not persuasive.

*With respect to art rejections based on Wilkinson et al, applicant contends that Wilkinson et al does not disclose or even suggest a member that is placed between the space defined by two plates of a gas separator for bonding the two plate together and that in the instant invention defined in independent claims 27 and 28 the member between the two plates of the separator*

Art Unit: 1745

*bonds the two plates together and the associated method comprises a bonding step that itself involves placing the member in the space between the two plates.*

In response, the art rejections based on Wilkinson et al. in the previous office action involving methods claims 8, 9, 11, 16, and 19, and 20 are withdrawn in view of applicant's newly added claim 28 which contains most of the limitations of cancelled claim 8. However, art rejections based on Wilkinson et al. involving the product claims 27, and 2-7 are applied since the metal foil is laminated in between the graphite foils and the intermediate metal foil bonded to a graphite foil on each of its two surfaces serves to indirectly bond the two graphite foils to one another.

*With respect to art rejections based on Yoshimura et al., applicant asserts that the reference does not disclose a member that is placed between the space defined by two plates of a gas separator for bonding the plate together and that Yoshimura et al. bond their two plates together, leaving the option of leaving the space in between empty or filled with an electrical conductive material (col. 13, lines 54-63) and that the reference does not disclose that the material bonds the two plates together.*

In response, Yoshimura et al. disclose that two base metal plates 65 and 66 having predetermined corrugations (rugged shapes) are formed by mechanically pressing thin stainless steel plates in step S100 (see col. 6, lines 15-17) and that in step 130, the base sheets 65, and 66 are joined face to face to complete separator 64 by employing an adhesive such as an electrically conductive paste (col. 7, lines 9-14) which is contradicts applicant's assertions that the electrical

Art Unit: 1745

conductive material does not bond the two plates together since Yoshimura et al. specifically discloses that the electrically conductive paste is an adhesive.

*With respect to art rejections based on Mukohyama et al., applicant asserts that Mukohyama et al. do not disclose a member that is placed between the space defined by two plates of a gas separator for bonding the plates together and that in the instant invention defined in independent claims 27 and 28, the member between the two plates of the separator bonds the two plates together and the associated method comprises a bonding step itself that involves placing the member in the space between the two plates and that these features are missing from Mukohyama et al.*

In response, independent claim 27 is a product claim and not a method claim and product by process limitations are not given patentable weight in a product claim. Furthermore, Mukohyama et al. was not applied previously or currently for the associated method claims.

### ***Conclusion***

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

Art Unit: 1745

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

18. Any inquiry concerning this communication or earlier communications should be directed to examiner Susy Tsang-Foster, Ph.D. whose telephone number is (571) 272-1293. The examiner can normally be reached on Monday through Friday from 9:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at (571) 272-1292.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

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st/ 

Susy Tsang-Foster  
Primary Examiner  
Art Unit 1745